REMARKS

In view of the foregoing amendments and the following remarks, reconsideration is respectfully requested.

Claims 1-29 stand rejected, and Claims 30-35 are newly presented, with Claims 1, 13, 30 and 33 being independent.

Claims 1-5, 7, 8 and 10-29 stand rejected under 35 U.S.C. 102(b) as allegedly being anticipated by Murakami et al. (U.S. Patent No. 4563689). This contention is respectfully traversed.

Claims 6 and 9 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Murakami et al. in view of Nakano et al (U.S. Patent No. 5359350). This contention is respectfully traversed.

Claims 1, 13, and 28 are currently amended. No new matter has been added.

35 U.S.C. 112, second paragraph – Claim 28

All features of the amended claim 28 have proper antecedent basis. For example, "pumping chambers" has been amended to "fluid chambers." The amended feature is recited in independent Claims 1 and 13. The Applicants respectfully request that the rejection under 35 U.S.C. 112, second paragraph, be withdrawn.

35 U.S.C. 102 – Claims 1, 5, 7, 8, 10-29

Claim 1

Claim 1 is patentable over Murakami because Murakami fails to anticipate each and every feature of the claim as arranged in the claim. For a claim to be anticipated by the prior art, it is necessary that a single prior art reference disclose each element of the claim under consideration. *Minnesota Mining and Mfg. Co. v. Johnson & Johnson Orthopaedics, Inc.*, 976 F.2d 1559, 1565 (Fed. Cir. 1992).

Claim 1 has been amended to include the feature of "a controller ... to set a constant amount of charge on respective said capacitances in the actuated condition when the respective

said first switch disconnects said electrical signal to the respective said electrically actuated displacement device, wherein the disconnection maintains a constant voltage on respective said capacitances by storing the constant amount of charge on respective said capacitances."

The amendments to Claim 1 are supported in the specification and no new matter has been added. For example, the controller is shown in Fig. 1 (described on page 4, lines 19-23), and a first charging switch 50 is shown in Fig. 3 (described on page 5, lines 8-19), with an accompanying timing diagram shown in Fig. 4 (described on page 5, lines 20-31; page 6, lines 1-6). In one exemplary description of the timing diagram, "at the end of pulse 64, switch 50 opens, and the ramping of voltage ends at Vpzt_finish ... piezoelectric actuator 38 (acting as a capacitor) then generally maintains its voltage Vpzt_finish" (instant disclosure: page 5, lines 22-24). In another example in the disclosure, "switch 50 could be closed to bring the voltage up to V1, then opened for a period of time to hold this voltage, then closed again to go up to voltage V2" (instant disclosure: page 8, lines 10-12). Therefore, the specification provides support for when the first (charging) switch is disconnected from the electrical signal, a constant amount of charge on respective said capacitances is stored (i.e., trapped) in the actuated condition and the voltage is held constant.

Murakami fails to anticipate the features of amended Claim 1. Murakami discloses an ink jet recording apparatus where a preceding pulse is applied to a transducer prior to the main pulse to control a position of the ink meniscus in the nozzle and to control the ink droplet size (Murakami: Abstract). Murakami does not disclose or suggest an apparatus such that the actuation condition occurs when the charging capacitor is *disconnected* from an electrical source. Instead, Murakami discloses that the actuation condition occurs when the charging capacitor is *connected* to the electrical source. For example, the actuation phase in Murakami occurs when the pulse signal M is high (Murakami: Col. 4, lines 62-68; Col. 5, lines 1-29; Figs. 3a, 3b, 4a, 4b, 8a, 8b, 8c, 9a, 9b, 11a, 11b). In one example, the actuation condition occurs when charging switch Tr2 is electrically connected to the voltage sourceV2 to connect the voltage source V2 to the piezoelectric crystal 7 in Fig. 5 (Murakami: Col. 5, lines 51-65). In another example, the actuation condition occurs when transistors Tr5 and Tr6 are electrically connected to the voltage

source V2 to electrically connect the voltage source V2 to the piezoelectric crystal 7 in Fig. 7 (Murakami: Col. 7, lines 7-13). In Fig. 10a, the actuation condition occurs when transistor Tr1 is electrically connected to voltage source V1 to electrically connect the voltage source V1 to the piezoelectric crystal 8 (Murakami: Col. 8, lines 31-37). In Fig. 10b, the actuation condition occurs when transistors Tr3 and Tr4 are electrically connected to connect the piezoelectric crystal 8 to voltage source V3 (Murakami: Col. 9, lines 4-12). In Fig. 12, the actuation condition occurs when transistor Tr8 is turned on to apply the positive polarity of the main pulse voltage to the piezoelectric crystal 8 (Murakami: Col. 10, lines 45-51). Moreover, Murakami discloses that there is a connected electrical path from the capacitor to a voltage source during the actuation condition that forces the amount of charge on the piezoelectric crystal (capacitor) to change and the voltage level across the capacitance to be driven by the voltage source (see above-cited sections of Murakami for Figs. 5, 7, 10a, 10b, and 12). Therefore, Claim 1 is patentable over Murakami for at least these reasons.

Furthermore, Claim 1 is patentable over Murakami because the reference does not disclose a configuration such that a constant amount of charge is set (e.g., fixed) on the capacitor when the charging switch is disconnected. In Claim 1, the disconnected electrical path between the electrical source and the capacitor stores a constant amount of charge on the capacitor because the charge is stored (i.e., trapped) on the capacitor. Murakami discloses that, after the charging switch is electrically disconnected from the capacitor, the charge leaves the piezoelectric crystal (capacitor) via a shunt resistor to ground (See shunt resistor connected in parallel with the piezoelectric crystal in Murakami for Figs. 5, 7, 10a, 10b, and 12).

Therefore, the Applicants believe that the rejection to Claim 1 under 35 U.S.C. 102 is improper and should be respectfully withdrawn for at least these reasons.

Claim 13

Independent Claim 13 has features that are similar to Claim 1 and is patentable for at least the same reasons above with respect to Claim 1. Allowance is respectfully requested for Claim 13.

Claims 2-5, 7-8, 10-12, 14-29

Dependent Claims 2-5, 7-8, 10-12, 14-29 are all allowable at least for depending upon an allowable base claim (base Claim 1 or 13). These dependent claims are also allowable for reciting allowable subject matter in their own right.

For example, Claims 3 and 15 recite a second switch for discharging the capacitor. However, Murakami discloses that, after the charging switch is electrically disconnected from the crystal, the charge leaves the piezoelectric crystal (capacitor) via a shunt resistor path to a ground terminal (See shunt resistor with one node connected to ground and another node connected with the piezoelectric crystal in Murakami for Figs. 5, 7, 10a, 10b, and 12).

Hence, the Applicants respectfully request that dependent Claims 2-5, 7-8, 10-12, 14-29 be put in condition for allowance.

35 U.S.C. 103 – Claims 6 and 9

Claims 6 and 9 are patentable over Murakami and Nakano at least because the references fail to teach or suggest each and every feature of the claims. Dependent Claims 6 and 9 are patentable over Murakami at least for the reasons above with respect to base Claim 1. In base Claim 1, the disconnected electrical path between the electrical source and the capacitor stores a constant amount of charge on the capacitor because the charge is stored (i.e., trapped) on the capacitor.

Nakano fails to remedy the deficiencies of Murakami. For example, Nakano teaches a method for driving an ink jet print head that reduces a magnitude of the natural ink oscillation occurring in the print head (Nakano: Abstract; Col. 2, lines 13-23). However, Nakano discloses that there is always a connected electrical path from the capacitor to a voltage source that forces the amount of charge on the piezoelectric crystal (capacitor) to change and the voltage level across the capacitance to be driven by the voltage source. There is not a time when the charge on the piezoelectric element 34 is trapped because of an electrical disconnection between the

piezoelectric element 34 and a voltage source (Nakano: Fig. 7A; Col. 9, lines 1-23). For instance, Nakano teaches that "a prescribed *source voltage being constantly applied* to the piezoelectric member to maintain a capacity of each of the liquid passages at a predetermined level" (Nakano: Col. 2, lines 33-36, *emphasis added*; see also Col. 4, lines 9-18; Col. 8, lines 46-49). In regards to the circuit driver diagram in Fig. 7A, Nakano teaches that the piezoelectric element 34 is always driven by either voltage source Vp or a driving signal. Nakano teaches that "the NPN transistor 32 is normally switched OFF" and "a *source voltage Vp is always applied* by the power supply 33 to the piezoelectric element 34 via the PNP transistor 31 and the resistor 29" (Nakano: Col. 9, lines 1-4, *emphasis added*). Therefore, the voltage on the piezoelectric element 34 is normally driven by the power supply. Nakano teaches that when the NPN transistor 32 is ON and the PNP transistor 31 is off, "a drive signal to be applied to the printing head thus appears at a terminal T4 of the piezoelectric element 34," the driving signal including pulse signals S1 and S2 (Nakano: Col. 9, lines 5-15). Furthermore, Nakano teaches:

> "When the voltage falling edge of the first pulse signal is applied, the piezoelectric element 34 is subjected to discharging via the resistor 30. When the voltage rising edge of the first pulse signal is applied, the piezoelectric element 34 is subjected to charging via the resistor 29. Thus, the discharging time and the charging time of the piezoelectric element 34 can be adjusted by changing a value of resistance of the resistors 30 and 29.

Therefore, the rejection under 35 U.S.C. 103 to Claims 6 and 9 are improper at least because the cited references fail to teach or suggest all of the features of the base claim, Claim 1. The Applicants respectfully request that Claims 6 and 9 be put in condition for allowance.

Newly Added Claims – Claims 30-35

Claims 30-35 are newly added claims. These claims include patentable subject matter that is similar to Claims 1-3 and 13-16. No new matter has been added. Claims 30-35 are in condition for allowance, and a notice to that effect is respectfully solicited.

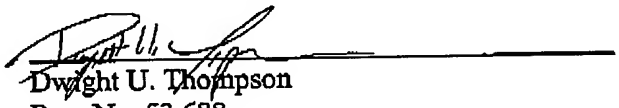
Conclusion

In view of the amendments and remarks herein, the Applicants believe that Claims 1-29 are in condition for allowance and ask that these pending claims be allowed. The foregoing comments made with respect to the positions taken by the Examiner are not to be construed as acquiescence with other positions of the Examiner that have not been explicitly contested. Accordingly, Applicants' arguments for patentability of a claim should not be construed as implying that there are not other valid reasons for patentability of that claim or other claims.

Please apply $500.00 for the additional claims fee, $120.00 for the one month extension fee and any other charges or credits to deposit account 06-1050.

Respectfully submitted,

Date: August 2, 2005



Dwight U. Thompson
Reg. No. 53,688

Fish & Richardson P.C.
Customer Number: 26161
12390 El Camino Real
San Diego, California 92130
Telephone: (858) 678-5070
Facsimile: (858) 678-5099

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